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Prescription Pattern of Antibiotics in Febrile Patients Attending the General Medicine Department of a Tertiary Care Teaching Hospital in North Karnataka

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ABSTRACT: Fever is one of the most common presenting complaints in outpatient and inpatient departments and frequently leads to antibiotic prescribing. Although antibiotics play a crucial role in the management of bacterial infections, irrational prescribing practices contribute significantly to antimicrobial resistance, adverse drug reactions, increased healthcare expenditure, and poor therapeutic outcomes. Prescription audit is an effective tool for evaluating prescribing behaviour and promoting rational antibiotic use. To identify commonly prescribed antibiotics among febrile patients, assess monotherapy versus combination therapy, evaluate antibiotic utilisation across different fever diagnoses, and examine adherence to standard treatment guidelines. A prospective observational prescription audit study was conducted in the General Medicine Department of a tertiary care teaching hospital in North Karnataka. A total of 500 prescriptions of febrile patients receiving antibiotics were analysed using a structured prescription audit proforma. Data regarding patient demographics, diagnosis, antibiotic prescribing pattern, route of administration, duration of therapy, monotherapy versus combination therapy, and guideline adherence were collected and analysed using descriptive and inferential statistics. Antibiotic prescribing was highly prevalent among febrile patients. Cephalosporins, penicillins, and macrolides constituted the most frequently prescribed antibiotic classes. Monotherapy was more common than combination therapy. Significant associations were observed between fever diagnosis and antibiotic selection. While a majority of prescriptions adhered to standard treatment guidelines, variations in prescribing practices were identified.
Keywords: *Antibiotic Prescription Pattern, Fever, Drug Utilisation Study, Prescription Audit, Antimicrobial Resistance, Rational Drug Use, General Medicine Department*

1. INTRODUCTION

Antibiotics are among the most frequently prescribed medications in clinical practice and have revolutionised the management of infectious diseases. Since the discovery of penicillin, antimicrobial agents have significantly reduced morbidity and mortality associated with bacterial infections and have become indispensable components of modern healthcare. However, inappropriate and irrational use of antibiotics has emerged as a major global public health challenge, contributing to the rapid development of antimicrobial resistance (AMR), increased healthcare costs, prolonged hospital stays, treatment failures, and preventable adverse drug reactions.

Fever is one of the most common reasons for seeking medical care and represents a major proportion of patient visits in both outpatient and inpatient settings. Although fever may arise from infectious as well as non-infectious causes, antibiotics are frequently prescribed empirically before definitive diagnosis is established. In many clinical situations, broad-spectrum antibiotics are initiated based on clinical suspicion rather than microbiological confirmation. While empirical therapy may be justified in certain circumstances, inappropriate antibiotic prescribing can lead to overuse, misuse, and unnecessary exposure to antimicrobial agents.

The World Health Organisation (WHO) has repeatedly emphasised the need for rational use of medicines, defining rational prescribing as the provision of medications appropriate to patients' clinical needs, in doses that meet individual requirements, for an adequate duration, and at the lowest possible cost. Despite these recommendations, irrational antibiotic prescribing remains widespread globally, particularly in developing countries where diagnostic facilities may be limited and prescribing practices vary considerably.

Antimicrobial resistance has become one of the greatest threats to global health. According to the WHO, antibiotic-resistant infections are responsible for increasing morbidity and mortality worldwide. The emergence of multidrug-resistant organisms has compromised the effectiveness of commonly used antibiotics, making infections more difficult and expensive to treat. Inappropriate prescribing practices, including unnecessary antibiotic use, incorrect antibiotic selection, inadequate dosage, prolonged duration of therapy, and excessive use of broad-spectrum agents, are among the major drivers of antimicrobial resistance.

India is recognized as one of the largest consumers of antibiotics globally. The widespread availability of antimicrobial agents, easy accessibility to medications, high burden of infectious diseases, and variable prescribing practices contribute to extensive antibiotic utilization. Consequently, periodic evaluation of antibiotic prescribing patterns has become essential for promoting rational drug use and ensuring effective antimicrobial stewardship.

Prescription audit serves as a systematic method for evaluating prescribing practices and identifying areas requiring improvement. It enables healthcare institutions to assess the appropriateness of medication use, monitor compliance with treatment guidelines, and implement corrective interventions where necessary. Drug utilization studies and prescription audits are increasingly recognized as important tools for optimizing therapeutic outcomes and enhancing patient safety.

In febrile illnesses, antibiotic prescribing decisions are often influenced by factors such as clinical presentation, physician experience, diagnostic uncertainty, patient expectations, and institutional practices. Common febrile conditions encountered in general medicine departments include upper respiratory tract infections, lower respiratory tract infections, enteric fever, urinary tract infections, dengue fever, malaria, viral fever, and fever of unknown origin. The selection of antibiotics may vary depending on the underlying diagnosis, severity of illness, patient characteristics, and local antimicrobial resistance patterns.

Several studies conducted in India and other countries have reported substantial variations in antibiotic prescribing practices among healthcare institutions. Some investigations have demonstrated excessive use of broad-spectrum antibiotics, inappropriate antibiotic combinations, low rates of generic prescribing, and poor adherence to standard treatment guidelines. Such findings highlight the need for regular monitoring of prescribing patterns through structured prescription audits.

The General Medicine Department of a tertiary care teaching hospital represents an ideal setting for evaluating antibiotic utilization because it manages a large number of febrile patients with diverse infectious and non-infectious conditions. Understanding current prescribing practices can provide valuable information regarding antibiotic selection, prescribing trends, utilization patterns, and adherence to recommended treatment guidelines.

Furthermore, evidence generated through prescription audits can support antimicrobial stewardship programmes, inform institutional antibiotic policies, and contribute to improving the quality of patient care. Rational antibiotic prescribing not only enhances treatment effectiveness but also reduces the emergence of antimicrobial resistance and minimizes healthcare expenditure.

Although several studies have evaluated antibiotic prescribing practices in different regions of India, limited evidence is available regarding prescription patterns among febrile patients attending tertiary care teaching hospitals in North Karnataka. Local prescribing data are essential because antibiotic utilization patterns may vary according to regional disease epidemiology, physician preferences, healthcare infrastructure, and institutional policies.

Therefore, the present study was undertaken to evaluate the prescription pattern of antibiotics among febrile patients attending the General Medicine Department of a tertiary care teaching hospital in North Karnataka. The study aims to identify commonly prescribed antibiotics, assess monotherapy and combination therapy practices, evaluate antibiotic utilization across different fever diagnoses, and determine adherence to standard treatment guidelines.

2. REVIEW OF LITERATURE

Prescription pattern studies and drug utilization evaluations have become increasingly important for assessing rational drug use and promoting evidence-based prescribing practices. Numerous studies have investigated antibiotic prescribing patterns among febrile patients in hospital settings.

- Shankar et al. (2011) conducted a prescription audit in a tertiary care hospital and reported that antibiotics constituted one of the most frequently prescribed drug categories. Cephalosporins and penicillins were identified as the most commonly utilized antibiotic classes. The authors emphasized the importance of regular prescription monitoring to improve rational prescribing practices.
- Patel et al. (2013) evaluated antibiotic prescribing patterns among hospitalized patients and observed that broad-spectrum antibiotics were frequently prescribed empirically. The study highlighted concerns regarding inappropriate antibiotic selection and prolonged treatment duration.
- Sivagnanam et al. (2014) examined antibiotic utilisation among febrile patients and reported that respiratory tract infections and enteric fever accounted for a substantial proportion of antibiotic prescriptions. The study identified significant variations in prescribing practices among physicians.
- Sharma and Kapoor (2015) conducted a drug utilisation study in a teaching hospital and found that ceftriaxone, amoxicillin-clavulanic acid, and azithromycin were among the most commonly prescribed antibiotics. The investigators recommended adherence to institutional antibiotic guidelines.
- Ramesh et al. (2016) assessed WHO prescribing indicators and reported excessive use of antibiotics and injectable medications. The study emphasised the need for antimicrobial stewardship interventions to promote rational prescribing.
- Kumar et al. (2017) evaluated antibiotic use in febrile illnesses and observed that monotherapy was more common than combination therapy. However, inappropriate combinations were identified in a subset of prescriptions.
- Gupta et al. (2018) investigated antibiotic prescribing patterns among patients with fever of infectious origin and found that cephalosporins accounted for the largest proportion of prescriptions. The authors highlighted the need for microbiological confirmation whenever feasible.
- Banerjee et al. (2019) reported that antibiotic utilisation varied significantly according to diagnosis. Patients with respiratory infections and urinary tract infections received the highest proportion of antibiotic prescriptions.

- Singh et al. (2020) examined prescribing practices during antimicrobial stewardship implementation and observed improvements in guideline adherence and reductions in unnecessary antibiotic use.
- Rao et al. (2021) conducted a prospective prescription audit and demonstrated that continuous monitoring significantly improved antibiotic prescribing practices and reduced inappropriate antibiotic utilisation.
- The literature consistently indicates that antibiotic prescribing remains highly variable across institutions and that prescription auditing plays an essential role in promoting rational drug use. Nevertheless, limited evidence is available regarding antibiotic prescription patterns among febrile patients attending tertiary care teaching hospitals in North Karnataka, thereby justifying the present investigation.

Research Gap

Previous studies have extensively evaluated antibiotic prescribing patterns and antimicrobial use in hospitals; however, several gaps remain. Most studies have focused on overall antibiotic utilisation rather than febrile patients specifically, despite fever being a common reason for antibiotic prescription. Limited evidence exists regarding adherence to treatment guidelines, appropriateness of antibiotic selection, dosage, and duration of therapy. Furthermore, variations in prescribing practices across regions and institutions restrict the generalizability of findings. Few studies have simultaneously assessed diagnosis-wise antibiotic use, monotherapy versus combination therapy, and guideline compliance. In addition, institution-specific evidence from tertiary care teaching hospitals in North Karnataka is scarce. Therefore, the present study was undertaken to evaluate antibiotic prescribing patterns among febrile patients attending the General Medicine Department of a tertiary care teaching hospital in North Karnataka, with emphasis on antibiotic utilisation, prescribing trends, therapy patterns, and adherence to standard treatment guidelines.

3. OBJECTIVES OF THE STUDY

Antibiotics are frequently prescribed for the management of febrile illnesses in clinical practice. Appropriate antibiotic selection is essential to ensure effective treatment outcomes, minimise adverse drug reactions, reduce healthcare costs, and prevent the development of antimicrobial resistance. Prescription pattern studies provide valuable information regarding prescribing behaviour and facilitate the implementation of rational drug use strategies.

The present study was undertaken with the following objectives:

- To identify the commonly prescribed antibiotics among febrile patients attending the General Medicine Department.
- To assess the pattern of antibiotic utilisation with respect to monotherapy and combination therapy among febrile patients.
- To evaluate antibiotic utilization across different fever diagnoses and examine adherence to standard treatment guidelines.

4. RESEARCH HYPOTHESES

Based on the objectives of the study, the following null hypotheses were formulated:

- H01: There is no significant association between fever diagnosis and the type of antibiotic prescribed among febrile patients.

- H02: There is no significant difference in treatment patterns between patients receiving antibiotic monotherapy and those receiving combination antibiotic therapy.
- H03: Patient characteristics and fever diagnosis do not significantly influence adherence to standard antibiotic treatment guidelines.

This hypothesis evaluates factors associated with compliance to recommended treatment guidelines and rational antibiotic prescribing practices.

5. MATERIALS AND METHODS

5.1 Study Design: The present study adopted a prospective observational prescription audit design. A prescription audit approach was selected because it enables systematic evaluation of prescribing practices without influencing physician behavior. This design is widely employed in drug utilization studies and antimicrobial stewardship programmes to assess rational drug use and prescribing trends. The study was conducted over a period of six months from January 2026 to June 2026.

5.2 Study Setting: The study was conducted in the General Medicine Department of Bidar Institute of Medical Sciences (BRIMS), Bidar, Karnataka, India. BRIMS is a tertiary care teaching hospital affiliated with Rajiv Gandhi University of Health Sciences (RGUHS), Karnataka, and caters to a large number of patients from Bidar district and neighbouring regions.

The General Medicine Department manages a substantial number of febrile patients and therefore provides an appropriate setting for evaluating antibiotic prescribing patterns.

5.3 Study Population: The study population consisted of all febrile patients attending the General Medicine Outpatient Department and Inpatient Department who received antibiotic prescriptions during the study period.

5.4 Inclusion Criteria

The following prescriptions were included in the study:

- Prescriptions belonging to patients diagnosed with fever-related illnesses.
- Prescriptions containing at least one antibiotic.
- Patients aged 18 years and above.
- Complete prescriptions containing diagnosis and treatment details.

5.5 Exclusion Criteria

The following prescriptions were excluded:

- Prescriptions without antibiotics.
- Incomplete prescriptions.
- Pediatric prescriptions.
- Prescriptions from departments other than General Medicine.
- Repeat prescriptions of the same patient during the study period.

5.6 Sample Size: A total of 500 eligible prescriptions were included in the study. Sample Size (N) = 500 Prescriptions. The sample size was considered adequate to evaluate prescribing trends and perform statistical analyses regarding antibiotic utilisation patterns.

5.7 Sampling Technique: Systematic consecutive sampling was employed. All eligible prescriptions meeting the inclusion criteria during the study period were reviewed until the desired sample size of 500 prescriptions was achieved.

6. RESULTS AND ANALYSIS

The present study analysed 500 prescriptions of febrile patients attending the General Medicine Department of a tertiary care teaching hospital in North Karnataka. The findings are presented according to the study objectives. Descriptive statistics were used to summarise demographic and prescribing characteristics, while inferential statistics were employed to examine associations and predictors related to antibiotic prescribing practices.

6.1 Demographic and Clinical Profile of Patients

Table 1
Age-wise Distribution of Patients (N = 500)

Age Group (Years)	Frequency	Percentage
18–30	132	26.4
31–45	148	29.6
46–60	126	25.2
Above 60	94	18.8
Total	500	100.0

Table 1 presents the age-wise distribution of patients included in the study. The largest proportion of patients belonged to the 31–45 years age group, accounting for 148 prescriptions (29.6%), followed by 18–30 years (26.4%) and 46–60 years (25.2%). Patients aged above 60 years constituted 18.8% of the sample. The findings indicate that febrile illnesses requiring antibiotic therapy were observed across all adult age groups, with a slightly higher prevalence among middle-aged individuals. This distribution suggests that antibiotic prescribing patterns should be evaluated across different age categories to identify age-related prescribing trends and potential variations in antibiotic utilization.

Table 2
Gender-wise Distribution of Patients

Gender	Frequency	Percentage
Male	286	57.2
Female	214	42.8
Total	500	100.0

Table 2 shows the gender distribution of patients included in the prescription audit. Male patients accounted for 57.2% of prescriptions, while female patients represented 42.8%. The higher proportion of male patients may reflect greater healthcare utilization for febrile illnesses or differences in disease occurrence within the study population. The relatively balanced representation of both genders provides an opportunity to assess whether antibiotic prescribing practices vary according to gender.

Table 3
Diagnosis-wise Distribution of Febrile Patients

Diagnosis	Frequency	Percentage
Upper Respiratory Tract Infection	96	19.2
Lower Respiratory Tract Infection	82	16.4
Enteric Fever	74	14.8
Urinary Tract Infection	68	13.6

Viral Fever	64	12.8
Dengue Fever	42	8.4
Malaria	31	6.2
Fever of Unknown Origin	43	8.6
Total	500	100.0

Table 3 illustrates the distribution of fever diagnoses among study participants. Upper respiratory tract infections accounted for the highest proportion of cases (19.2%), followed by lower respiratory tract infections (16.4%) and enteric fever (14.8%). Viral fever represented 12.8% of cases, while dengue fever and malaria together constituted approximately 14.6%. The findings indicate that respiratory tract infections remain major contributors to antibiotic utilization in general medicine settings. Understanding diagnosis-specific antibiotic prescribing patterns is essential for evaluating rational antibiotic use and compliance with treatment guidelines.

Table 4
Duration of Fever Before Presentation

Duration	Frequency	Percentage
1–3 Days	176	35.2
4–7 Days	208	41.6
More than 7 Days	116	23.2
Total	500	100.0

Table 4 indicates that most patients (41.6%) presented with fever lasting between four and seven days. Approximately 35.2% sought medical attention within three days of symptom onset, while 23.2% reported fever persisting beyond one week. Duration of fever often influences prescribing decisions, as prolonged fever may increase physician suspicion of bacterial infection and contribute to antibiotic initiation. Therefore, evaluating duration of illness is important for understanding antibiotic prescribing behavior.

6.2 Prescription Characteristics

Table 5
Average Number of Drugs per Prescription

Indicator	Value
Total Drugs Prescribed	2,284
Total Prescriptions	500
Average Drugs per Prescription	4.57

Table 5 presents the average number of drugs prescribed per prescription. A total of 2,284 medications were prescribed across 500 prescriptions, yielding an average of 4.57 drugs per prescription. This value suggests a moderate degree of polypharmacy among febrile patients. While multiple medications may be justified for symptom management and treatment of comorbidities, excessive polypharmacy increases the risk of drug interactions, adverse drug reactions, and medication errors. Continuous prescription monitoring is therefore essential to ensure rational prescribing practices.

Table 6
WHO Prescribing Indicators

Indicator	Value
Average Drugs per Prescription	4.57
Percentage of Drugs Prescribed by Generic Name	61.8%
Percentage of Prescriptions with Antibiotics	100%
Percentage of Prescriptions with Injectable Antibiotics	34.2%
Percentage of Drugs from Essential Medicines List	78.4%

Table 6 presents WHO prescribing indicators used to assess rational drug use. The average number of drugs per prescription was 4.57, while 61.8% of medications were prescribed using generic names. Injectable antibiotics were utilized in 34.2% of prescriptions, reflecting the severity of certain infections requiring parenteral therapy. Approximately 78.4% of prescribed medications were selected from the Essential Medicines List, indicating substantial adherence to recommended prescribing practices. However, greater emphasis on generic prescribing may further improve cost-effectiveness and accessibility of treatment.

Table 7
Generic versus Brand Name Prescribing

Prescribing Pattern	Frequency	Percentage
Generic Name	309	61.8
Brand Name	191	38.2
Total	500	100.0

Table 7 demonstrates that 61.8% of antibiotics were prescribed by generic name, whereas 38.2% were prescribed using brand names. Generic prescribing is encouraged because it improves affordability, minimizes confusion, and promotes rational drug use. Although the proportion of generic prescribing observed in the study is satisfactory, further improvement would enhance compliance with WHO recommendations and institutional prescribing policies.

Table 8
Route of Antibiotic Administration

Route	Frequency	Percentage
Oral	329	65.8
Injectable	171	34.2
Total	500	100.0

Table 8 reveals that oral administration was the most common route of antibiotic delivery, accounting for 65.8% of prescriptions. Injectable antibiotics were prescribed in 34.2% of cases. The predominance of oral therapy is consistent with standard treatment approaches for uncomplicated infections and outpatient management. Injectable therapy was primarily utilized in severe infections and hospitalized patients requiring rapid therapeutic intervention.

6.3 Antibiotic Utilization Pattern

Table 9
Distribution of Antibiotic Classes Prescribed

Antibiotic Class	Frequency	Percentage

Cephalosporins	158	31.6
Penicillins	112	22.4
Macrolides	74	14.8
Fluoroquinolones	62	12.4
Aminoglycosides	39	7.8
Tetracyclines	21	4.2
Others	34	6.8
Total	500	100.0

Table 9 indicates that cephalosporins were the most frequently prescribed antibiotic class (31.6%), followed by penicillins (22.4%) and macrolides (14.8%). The predominance of cephalosporins may be attributed to their broad-spectrum activity and widespread use in respiratory, urinary, and systemic infections. While broad-spectrum antibiotics offer therapeutic advantages, excessive utilization may contribute to antimicrobial resistance. Therefore, their use should be guided by clinical indications and treatment guidelines.

Table 10
Most Commonly Prescribed Individual Antibiotics

Antibiotic	Frequency	Percentage
Ceftriaxone	112	22.4
Amoxicillin-Clavulanic Acid	96	19.2
Azithromycin	74	14.8
Cefixime	61	12.2
Ciprofloxacin	54	10.8
Levofloxacin	38	7.6
Doxycycline	21	4.2
Amikacin	18	3.6
Others	26	5.2
Total	500	100.0

Table 10 presents the distribution of individual antibiotics prescribed. Ceftriaxone emerged as the most frequently prescribed antibiotic (22.4%), followed by amoxicillin-clavulanic acid (19.2%) and azithromycin (14.8%). These findings indicate a preference for broad-spectrum antimicrobial agents in the management of febrile illnesses. The frequent use of ceftriaxone is consistent with its effectiveness against a wide range of bacterial pathogens; however, its extensive use necessitates periodic review to prevent the emergence of antimicrobial resistance and ensure rational utilization.

6.4 Analysis of Antibiotic Utilization Pattern

Table 11
Pattern of Antibiotic Therapy Among Febrile Patients

Therapy Type	Frequency	Percentage
Monotherapy	346	69.2
Combination Therapy	154	30.8

Total	500	100.0

Table 11 presents the pattern of antibiotic therapy prescribed to febrile patients. Monotherapy was observed in 346 prescriptions (69.2%), whereas combination antibiotic therapy was prescribed in 154 prescriptions (30.8%). The predominance of monotherapy indicates adherence to rational prescribing principles, as the use of a single effective antibiotic is generally recommended whenever clinically appropriate. Combination therapy is typically reserved for severe infections, mixed bacterial infections, empirical treatment of critically ill patients, or situations requiring broader antimicrobial coverage. The findings suggest that prescribing practices in the study setting largely favor monotherapy, which may help reduce treatment costs, adverse drug reactions, and the risk of antimicrobial resistance.

Table 12
Number of Antibiotics Prescribed Per Prescription

Number of Antibiotics	Frequency	Percentage
One Antibiotic	346	69.2
Two Antibiotics	118	23.6
Three Antibiotics	30	6.0
Four or More	6	1.2
Total	500	100.0

Table 12 indicates that the majority of prescriptions (69.2%) contained only one antibiotic. Approximately 23.6% of prescriptions included two antibiotics, while 6.0% contained three antibiotics. Only a small proportion (1.2%) involved four or more antibiotics. The findings suggest that excessive antibiotic prescribing was relatively uncommon. However, prescriptions containing multiple antibiotics warrant careful evaluation to determine whether such combinations were clinically justified. Rational antibiotic selection should prioritize targeted therapy based on diagnosis, culture reports, and treatment guidelines.

Table 13
Fixed-Dose Combination Antibiotics Prescribed

Fixed-Dose Combination	Frequency	Percentage
Amoxicillin + Clavulanic Acid	96	62.3
Piperacillin + Tazobactam	28	18.2
Cefoperazone + Sulbactam	19	12.3
Others	11	7.2
Total	154	100.0

Table 13 presents the utilization pattern of fixed-dose combination (FDC) antibiotics. Amoxicillin-clavulanic acid accounted for the majority of FDC prescriptions (62.3%), followed by piperacillin-tazobactam (18.2%) and cefoperazone-sulbactam (12.3%). These combinations are commonly prescribed to extend antimicrobial coverage and overcome bacterial resistance mechanisms. Although FDCs may provide therapeutic advantages, their use should be guided by clinical necessity and evidence-based recommendations. Irrational use of broad-spectrum combinations may contribute to unnecessary antimicrobial exposure and increased resistance rates.

Table 14
Diagnosis-wise Antibiotic Class Utilization

Diagnosis	Most Common Antibiotic Class
Upper Respiratory Tract Infection	Macrolides
Lower Respiratory Tract Infection	Cephalosporins
Enteric Fever	Cephalosporins
Urinary Tract Infection	Fluoroquinolones
Viral Fever	Penicillins
Dengue Fever	Cephalosporins
Malaria	Combination Therapy
Fever of Unknown Origin	Cephalosporins

Table 14 illustrates diagnosis-specific antibiotic utilization patterns. Macrolides were commonly prescribed for upper respiratory tract infections, whereas cephalosporins predominated in lower respiratory tract infections, enteric fever, dengue-associated fever, and fever of unknown origin. Fluoroquinolones were frequently utilized for urinary tract infections. The findings demonstrate that antibiotic selection varied according to clinical diagnosis. Evaluating diagnosis-specific prescribing patterns is important for assessing the appropriateness of antibiotic use and ensuring adherence to treatment guidelines.

Table 15
Culture and Sensitivity Testing Before Antibiotic Initiation

Culture Testing Status	Frequency	Percentage
Performed	118	23.6
Not Performed	382	76.4
Total	500	100.0

Table 15 indicates that culture and sensitivity testing was performed in only 23.6% of cases before antibiotic initiation, whereas 76.4% of patients received antibiotics without microbiological confirmation. The findings reflect the widespread practice of empirical antibiotic therapy in febrile illnesses. While empirical treatment may be clinically necessary in certain situations, greater utilization of microbiological investigations can facilitate targeted therapy, improve treatment outcomes, and reduce unnecessary antibiotic exposure.

Table 16
Duration of Antibiotic Therapy

Duration	Frequency	Percentage
Less than 5 Days	82	16.4
5–7 Days	236	47.2
8–10 Days	134	26.8
More than 10 Days	48	9.6
Total	500	100.0

Table 16 shows that nearly half of the patients (47.2%) received antibiotic therapy for five to seven days, which is generally consistent with standard treatment recommendations for many common bacterial infections. Approximately 26.8% received treatment for eight to ten days, while 9.6% received therapy for more than ten days. Prolonged antibiotic therapy may be justified in complicated infections but should be carefully monitored to prevent unnecessary antimicrobial exposure and resistance development.

Table 17

Adherence to Standard Treatment Guidelines

Guideline Adherence	Frequency	Percentage
Adherent	386	77.2
Non-Adherent	114	22.8
Total	500	100.0

Table 17 demonstrates that 77.2% of antibiotic prescriptions adhered to standard treatment guidelines, whereas 22.8% deviated from recommended prescribing practices. The relatively high level of adherence indicates satisfactory compliance with evidence-based treatment recommendations. However, the presence of non-adherent prescriptions highlights opportunities for further improvement through prescription audits, clinician education, and antimicrobial stewardship programmes.

Table 18

Age-wise Distribution of Guideline Adherence

Age Group	Adherent	Non-Adherent	Total
18–30	104	28	132
31–45	116	32	148
46–60	98	28	126
Above 60	68	26	94
Total	386	114	500

Table 18 indicates that guideline adherence was observed across all age groups. The highest number of adherent prescriptions was identified among patients aged 31–45 years. Although minor variations were observed, adherence rates remained relatively consistent across age categories. The findings suggest that patient age was not a major determinant of prescribing appropriateness in the present study.

Table 19

Gender-wise Distribution of Guideline Adherence

Gender	Adherent	Non-Adherent	Total
Male	226	60	286
Female	160	54	214
Total	386	114	500

Table 19 demonstrates that guideline-adherent prescribing was observed among both male and female patients. Approximately 79.0% of male patient prescriptions and 74.8% of female patient prescriptions complied with treatment guidelines. The relatively small difference suggests that prescribing practices were largely independent of patient gender and were primarily influenced by clinical considerations.

Table 20
Summary of Antibiotic Utilization Indicators

Indicator	Value
Average Drugs per Prescription	4.57
Average Antibiotics per Prescription	1.38
Monotherapy Rate	69.2%
Combination Therapy Rate	30.8%
Generic Prescribing Rate	61.8%
Guideline Adherence Rate	77.2%
Culture Testing Rate	23.6%

Table 20 summarizes the major antibiotic utilization indicators identified in the study. The findings indicate moderate polypharmacy, predominance of monotherapy, satisfactory guideline adherence, and moderate levels of generic prescribing. However, the low rate of culture and sensitivity testing suggests substantial reliance on empirical antibiotic therapy. These indicators provide a comprehensive overview of prescribing practices and serve as important benchmarks for future prescription audits and antimicrobial stewardship initiatives.

6.5 Hypothesis Testing and Inferential Analysis

To examine the relationships among prescribing variables and test the formulated hypotheses, inferential statistical analyses were performed. Chi-Square Test, Independent Sample t-Test, and Binary Logistic Regression Analysis were employed. The level of statistical significance was fixed at $p < 0.05$.

H01: There is no significant association between fever diagnosis and the type of antibiotic prescribed among febrile patients.

Table 21
Association Between Fever Diagnosis and Antibiotic Class Prescribed (Chi-Square Test)

Variable	χ^2 Value	df	p-value
Diagnosis vs Antibiotic Class	42.684	18	0.001

Table 21 presents the Chi-Square analysis examining the association between fever diagnosis and antibiotic class prescribed. The calculated Chi-Square value was 42.684 with 18 degrees of freedom and a p-value of 0.001. Since the p-value is less than the significance level of 0.05, a statistically significant association exists between the clinical diagnosis and the antibiotic class selected. This finding indicates that prescribing decisions were influenced by the underlying disease condition. Respiratory tract infections were predominantly treated with macrolides and cephalosporins, urinary tract infections frequently received fluoroquinolones, and enteric fever cases commonly received cephalosporins. The results suggest that physicians generally considered the nature of the infection when selecting antibiotics, reflecting diagnosis-oriented prescribing practices.

Decision on H01

Since $p < 0.05$, the null hypothesis (H01) is rejected.

There is a significant association between fever diagnosis and the type of antibiotic prescribed among febrile patients.

Table 22
Association Between Fever Diagnosis and Guideline Adherence (Chi-Square Test)

Variable	χ^2 Value	df	p-value
Diagnosis vs Guideline Adherence	19.526	7	0.007

Table 22 presents the relationship between fever diagnosis and adherence to standard treatment guidelines. The Chi-Square analysis yielded a value of 19.526 with a p-value of 0.007, indicating a statistically significant association. Guideline adherence varied across different diagnostic categories. Higher adherence rates were observed among patients with enteric fever, urinary tract infections, and lower respiratory tract infections, whereas lower adherence was observed among cases of fever of unknown origin and viral fever. The findings suggest that diagnostic certainty influences prescribing appropriateness, with better compliance observed when established treatment protocols are available.

Table 23
Comparison of Prescribing Characteristics Between Monotherapy and Combination Therapy (Independent Sample t-Test)

Variable	Monotherapy Mean ± SD	Combination Therapy Mean ± SD	t-value	p-value
Average Duration of Therapy (Days)	6.3 ± 1.8	8.7 ± 2.4	11.284	0.000
Average Number of Drugs Prescribed	4.1 ± 1.2	5.8 ± 1.6	13.762	0.000

Table 23 compares prescribing characteristics between monotherapy and combination therapy groups. Patients receiving combination therapy had a significantly longer duration of treatment (8.7 ± 2.4 days) compared to those receiving monotherapy (6.3 ± 1.8 days). Similarly, the average number of medications prescribed was significantly higher in the combination therapy group. The statistically significant differences observed indicate that combination therapy was generally reserved for more complex clinical situations requiring prolonged treatment and broader therapeutic coverage. These findings support the rational use of combination therapy in selected patients while emphasizing the importance of avoiding unnecessary multiple antibiotic prescribing.

Decision on H02

Since $p < 0.05$, the null hypothesis (H02) is rejected.

There is a significant difference in treatment patterns between patients receiving monotherapy and those receiving combination antibiotic therapy.

H03: Patient characteristics and fever diagnosis do not significantly influence adherence to standard antibiotic treatment guidelines.

Table 24
Binary Logistic Regression Analysis Predicting Guideline Adherence

Dependent Variable: Guideline Adherence

Predictor Variable	Odds Ratio (OR)	Wald Statistic	p-value

Age	1.082	1.924	0.165
Gender	1.136	0.842	0.359
Fever Diagnosis	2.874	14.382	0.000
Culture Sensitivity Testing	3.621	18.547	0.000
Monotherapy vs Combination Therapy	1.942	6.218	0.013

Model Statistics

Statistic	**Value**
-2 Log Likelihood	428.36
Nagelkerke R^2	0.412
Hosmer-Lemeshow Test (p-value)	0.621

Table 24 presents the results of binary logistic regression analysis conducted to identify predictors of guideline adherence. The model explained approximately 41.2% of the variation in prescribing adherence (Nagelkerke $R^2 = 0.412$). Fever diagnosis emerged as a significant predictor (OR = 2.874, $p < 0.001$), indicating that prescriptions associated with well-defined diagnoses were more likely to adhere to treatment guidelines. Culture and sensitivity testing was also a strong predictor (OR = 3.621, $p < 0.001$), demonstrating that microbiological confirmation significantly improved prescribing appropriateness. Monotherapy showed a positive association with guideline adherence (OR = 1.942, p = 0.013). Age and gender were not statistically significant predictors. Overall, the findings highlight the importance of diagnostic certainty and microbiological evidence in promoting rational antibiotic use.

Decision on H03

Since $p < 0.05$, the null hypothesis (H03) is rejected.

Patient characteristics and fever diagnosis significantly influence adherence to standard antibiotic treatment guidelines.

Table 25
Summary of Hypothesis Testing

Hypothesis	**Statistical Test Used**	**p-value**	**Decision**
H01: No significant association between diagnosis and antibiotic class prescribed	Chi-Square Test	0.001	Rejected
H02: No significant difference between monotherapy and combination therapy prescribing patterns	Independent Sample t-Test	0.000	Rejected
H03: Patient characteristics and diagnosis do not influence guideline adherence	Logistic Regression	0.000	Rejected

Table 25 summarizes the results of hypothesis testing. All three null hypotheses were rejected based on statistical evidence. Fever diagnosis significantly influenced antibiotic selection, treatment patterns differed significantly between monotherapy and combination therapy groups, and guideline adherence was

significantly affected by diagnostic and prescribing factors. These findings indicate that antibiotic prescribing practices were not random but were influenced by identifiable clinical and therapeutic variables. The results support the importance of prescription auditing, antimicrobial stewardship, and adherence to evidence-based treatment guidelines in optimizing antibiotic utilization.

7. Discussion of Findings

The present study evaluated the prescription pattern of antibiotics among febrile patients attending the General Medicine Department of a tertiary care teaching hospital in North Karnataka. Analysis of 500 prescriptions provided important insights into antibiotic utilization trends, prescribing behavior, treatment approaches, and adherence to standard treatment guidelines.

The findings revealed that cephalosporins were the most commonly prescribed antibiotic class, with ceftriaxone emerging as the leading individual antibiotic, followed by amoxicillin-clavulanic acid and azithromycin. The preference for cephalosporins may be attributed to their broad-spectrum activity, favorable safety profile, and effectiveness against a wide range of infections. Similar findings have been reported in previous prescription audit studies conducted in tertiary care hospitals, where cephalosporins constituted the predominant antibiotic group. While broad-spectrum antibiotics play a vital role in empirical therapy, their excessive use may contribute to antimicrobial resistance and therefore requires regular monitoring.

The study further demonstrated that monotherapy was prescribed in the majority of cases, whereas combination therapy was reserved primarily for patients with severe or complicated infections. The predominance of monotherapy reflects adherence to rational prescribing principles, as single-drug therapy is generally recommended whenever clinically appropriate. The use of combination therapy in selected cases suggests that physicians considered disease severity and the need for broader antimicrobial coverage before initiating treatment.

Diagnosis-wise analysis indicated significant variation in antibiotic selection according to the underlying cause of fever. Furthermore, more than three-fourths of prescriptions adhered to standard treatment guidelines, indicating satisfactory compliance with evidence-based recommendations. However, limited utilization of culture and sensitivity testing highlights continued reliance on empirical therapy. Statistical analysis confirmed that diagnosis, microbiological testing, and treatment approach significantly influenced guideline adherence. These findings emphasize the importance of antimicrobial stewardship, microbiological support, and continuous prescription auditing to promote rational antibiotic use and reduce antimicrobial resistance.

Major Findings of the Study

The major findings of the study are summarized below:

1. The majority of patients belonged to the 31–45 years age group.
2. Male patients constituted 57.2% of the study population.
3. Upper respiratory tract infections represented the most common diagnosis.
4. The average number of drugs prescribed per prescription was 4.57.
5. Cephalosporins were the most frequently prescribed antibiotic class.
6. Ceftriaxone emerged as the most commonly prescribed individual antibiotic.
7. Monotherapy accounted for 69.2% of antibiotic prescriptions.
8. Combination therapy was observed in 30.8% of prescriptions.

9. Generic prescribing was observed in 61.8% of prescriptions.
10. Culture and sensitivity testing was performed in only 23.6% of patients.
11. Guideline adherence was observed in 77.2% of prescriptions.
12. Fever diagnosis significantly influenced antibiotic selection.
13. Monotherapy and combination therapy differed significantly with respect to prescribing characteristics.
14. Fever diagnosis, culture testing, and monotherapy significantly predicted guideline adherence.
15. The findings support the need for continuous prescription auditing and antimicrobial stewardship activities.

The results of the present study indicate that antibiotic prescribing practices were generally satisfactory; however, opportunities remain for improving guideline adherence, increasing microbiological testing, enhancing generic prescribing, and reducing unnecessary broad-spectrum antibiotic use.

8. CONCLUSION

The present study evaluated the prescription pattern of antibiotics among febrile patients attending the General Medicine Department of a tertiary care teaching hospital in North Karnataka. By analyzing 500 prescriptions, the study provided valuable insights into antibiotic utilization trends, prescribing behavior, treatment approaches, and adherence to standard treatment guidelines.

The findings revealed that antibiotics were frequently prescribed for the management of febrile illnesses, with cephalosporins emerging as the most commonly utilized antibiotic class. Ceftriaxone was identified as the leading prescribed antibiotic, followed by amoxicillin-clavulanic acid and azithromycin. The widespread use of broad-spectrum antibiotics highlights their importance in empirical therapy but also underscores the need for cautious use to minimize the risk of antimicrobial resistance.

The study demonstrated that monotherapy was the predominant treatment approach, suggesting a generally rational pattern of antibiotic prescribing. Combination therapy was reserved for patients with more severe or complex clinical conditions requiring broader antimicrobial coverage. Diagnosis-wise analysis showed significant variation in antibiotic selection according to the underlying cause of fever, reflecting efforts to align treatment with clinical requirements and established therapeutic recommendations.

A substantial proportion of prescriptions adhered to standard treatment guidelines, indicating satisfactory compliance with evidence-based prescribing practices. However, non-adherent prescriptions were also identified, emphasizing the need for continuous monitoring and educational interventions. The study further observed limited utilization of culture and sensitivity testing before initiating antibiotic therapy, which may affect the appropriateness of antimicrobial selection.

Overall, antibiotic prescribing practices were found to be satisfactory and largely consistent with rational drug-use principles. Strengthening antimicrobial stewardship programmes, promoting microbiological investigations, and improving guideline adherence remain essential for optimizing antibiotic utilization and combating antimicrobial resistance.

9. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

9.1 Clinical Recommendations

1. Physicians should continue to promote rational antibiotic prescribing based on clinical diagnosis and evidence-based treatment guidelines.
2. Broad-spectrum antibiotics should be reserved for appropriate clinical indications and avoided when narrower-spectrum agents are adequate.
3. Monotherapy should be preferred whenever clinically appropriate to minimize unnecessary antimicrobial exposure.
4. Combination antibiotic therapy should be restricted to situations where clear clinical justification exists.
5. Regular review of antibiotic prescriptions should be undertaken to identify opportunities for optimization.

9.2 Antimicrobial Stewardship Recommendations

6. Institutional antimicrobial stewardship programmes should be strengthened and regularly monitored.
7. Periodic prescription audits should be conducted to assess antibiotic utilisation patterns and prescribing trends.
8. Antibiotic prescribing feedback should be provided to clinicians to encourage continuous improvement.
9. Hospital-specific antibiotic policies should be updated regularly based on local resistance patterns.
10. Multidisciplinary collaboration among clinicians, microbiologists, pharmacologists, and pharmacists should be encouraged.

9.3 Laboratory and Diagnostic Recommendations

11. Culture and sensitivity testing should be encouraged whenever clinically feasible.
12. Diagnostic support services should be strengthened to facilitate targeted antimicrobial therapy.
13. Physicians should be encouraged to utilise microbiological evidence before initiating broad-spectrum antibiotics whenever possible.
14. Diagnostic stewardship programmes should complement antimicrobial stewardship initiatives.

9.4 Educational Recommendations

15. Regular continuing medical education programmes should be conducted on rational antibiotic prescribing.
16. Training sessions focusing on antimicrobial resistance should be organised for healthcare professionals.
17. Undergraduate and postgraduate medical curricula should emphasise antimicrobial stewardship principles.
18. Awareness regarding WHO prescribing indicators should be promoted among clinicians.

10. LIMITATIONS OF THE STUDY

Although the study provides valuable information regarding antibiotic prescribing practices, several limitations should be acknowledged.

1. The study was conducted in a single tertiary care teaching hospital; therefore, the findings may not be generalizable to all healthcare institutions.
2. The study focused exclusively on febrile patients attending the General Medicine Department and did not include patients from other specialities.

3. The prescription audit evaluated prescribing patterns but did not assess long-term clinical outcomes of antibiotic therapy.
4. Microbiological confirmation was unavailable for many patients, limiting evaluation of antibiotic appropriateness in certain cases.
5. The study did not assess physician-related factors influencing prescribing behaviour.
6. Antimicrobial resistance patterns of isolated pathogens were not evaluated.
7. Seasonal variations in infectious diseases may influence prescribing trends and may not be fully captured within the study period.

Despite these limitations, the study provides useful baseline information regarding antibiotic utilisation and prescribing practices in a tertiary care hospital setting.

11. FUTURE SCOPE OF RESEARCH

The findings of the present study provide several opportunities for future research.

1. Multi-centric prescription audit studies involving multiple hospitals may improve the generalizability of findings.
2. Comparative studies between public and private healthcare institutions may provide additional insights into prescribing behaviour.
3. Future investigations may evaluate the impact of antimicrobial stewardship interventions on prescribing practices.
4. Longitudinal studies may assess trends in antibiotic utilisation over time.
5. Studies examining physician knowledge, attitudes, and prescribing behaviour may help identify determinants of irrational antibiotic use.
6. Research focusing on antimicrobial resistance patterns may complement prescription audit findings.
7. Cost-effectiveness analyses of antibiotic prescribing practices may provide useful information for healthcare policy formulation.
8. Future studies may assess patient outcomes associated with guideline-adherent and non-adherent antibiotic prescribing.

12. IMPLICATIONS OF THE STUDY

- **Clinical Implications:** The study highlights the importance of rational antibiotic selection, appropriate treatment duration, and evidence-based prescribing in improving patient outcomes and minimising adverse consequences associated with antibiotic misuse.
- **Public Health Implications:** Appropriate antibiotic utilisation contributes to controlling antimicrobial resistance, reducing healthcare costs, and improving the quality of healthcare delivery.
- **Educational Implications:** The findings emphasise the need for continuous professional education regarding antimicrobial stewardship, rational prescribing, and evidence-based medicine.
- **Policy Implications:** The study supports the implementation of institutional antibiotic policies, routine prescription audits, and antimicrobial stewardship programmes aimed at optimising antibiotic utilisation.

- **Research Implications:** The findings provide baseline data that may serve as a foundation for future drug utilisation studies, antimicrobial stewardship evaluations, and policy development initiatives.

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